

# PATENT ABSTRACTS OF JAPAN

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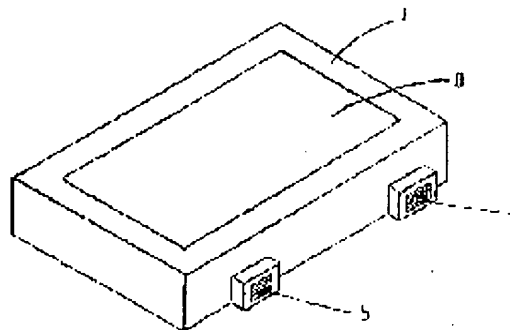
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(54) BACKLIGHT

(57)Abstract:

PROBLEM TO BE SOLVED: To stabilize the brightness of a cold cathode-ray tube with the ambient temperature kept at an optimum and prevent the partial temperature rise of a backlight body.

SOLUTION: Air is forcibly applied for cooling a hot portion by means using a fan for blowing an air to an interior of a reflector used for a light guide plate type backlight or to the end of a light source that becomes hot, or a portion embracing the end of the light source, that becomes hot, or by sucking or exhausting air from the interior.



## LEGAL STATUS

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the back light used for various display boards including a liquid crystal display component or an advertisement etc.

[0002]

[Description of the Prior Art] Before, a thin cold cathode tube and a thin hot cathode tube were used for the light source of the back light for liquid crystal display components by the light guide plate method and the directly under light source method, and the hot cathode tube (this is hereafter called fluorescent lamp.) called the so-called fluorescent lamp has been used for the large-sized back light for an advertisement. The method which lengthens greatly some of methods which these discharge tubes make identify the temperature of the whole tubing using a metal reflector since temperature becomes low as generation of heat of a tubing edge is high and separates from a tubing edge, and are made to radiate heat, and these metal reflectors to an anti-luminescence side side, i.e., the light guide plate bottom, and heightens the heat dissipation effectiveness has been taken.

[0003] However, in order to make it the large luminescence side searched for in recent years and to make the back light of high brightness, although the object which also used calorific value combining many hot cathode tubes of many thin figures, or slender fluorescent lamps or thin cold cathode tubes although it was high brightness is bright, calorific value is also in the situation that many light sources must be used. However, the problem referred to as producing filter burning in some color filters of the electrochromatic display display device which originates in heat dissipation of the light source so that calorific value may also be looked at by some back lights of the small directly under light source method for electrochromatic display display devices using a hot cathode tube, although it is high brightness, for example arises. Moreover, in order to use an acrylic weak to an elevated temperature for a light guide plate base material by the light guide plate method, although it is high brightness, also as for calorific value, use of many hot cathode tubes or a fluorescent lamp has many problems. Ambient temperature from which it will generate heat if it uses combining a large number even if it makes it \*\*\*\* and the cold cathode tube which is using it abundantly, and the cure against heat dissipation for light guide plates is needed after all, and the highest brightness of Centigrade 30 to 40 which is property of cold cathode tube further degree Centigrade is obtained (this is hereafter called optimum temperature.) Even if it considered as top-most vertices, it became higher than optimum temperature and it became low, by the conventional method, it had the problem whose correspondence is impossible, such as producing the brightness fall problem by brightness falling.

[0004]

[Problem(s) to be Solved by the Invention] In the bottom of the present condition that the light source with little calorific value is not acquired with brightness with sufficient this invention With the discharge heat which the discharge component prepared in the interior of the both ends of the various discharge tubes mentioned above so that it may also make calorific value into a large luminescence side using many light sources and it may make the back light of high brightness, although it is bright emits Taking

into consideration the property in which temperature becomes low as the temperature of the external both ends of the discharge tube becomes high and separates from the both ends of the discharge tube even if it uses combining many cold cathode tubes -- the temperature near optimum temperature -- it can maintain -- making -- the brightness of a cold cathode tube -- the maximum drawer \*\*\*\*, while making it like They are sucking or the thing which is going to carry out ventilation cooling compulsorily and is going to make a back light with few faults effectively about generation of heat of the various discharge tubes which are going to make an elevated temperature the countermeasure to heat of the light guide plate which uses a weak acrylic as a base material, and cause color filter burning of an electrochromatic display device.

[0005]

[Means for Solving the Problem] According to the purpose of upper \*\*, this invention prepares ventilation opening or sucking opening in a reflector, and goes via the hoe chimney stack's blast pipe (this is hereafter called duct.) directly from ventilation and an inhalation-of-air fan (this is hereafter called fan.). While carrying out maintenance of the optimum temperature of a cold cathode tube, and the countermeasure to heat of a light guide plate by ventilating compulsorily in a reflector or sucking out of the inside of a reflector compulsorily Conventionally, take out the light source edge where the brightness of a cold cathode tube is low outside the ON light field of a light guide plate edge for the purpose of brightness equalization of the countermeasure to heat of a light guide plate, and a luminescence side, or also about the object made into the structure of exposing a light source edge to the exterior of a reflector As the cure against a temperature rise of the light source edge accompanying a raise in brightness, and a countermeasure to heat of a light guide plate, the temperature of a light source edge tends to ventilation, exhaust or sucking exhaust compulsorily into the part which becomes high, and tends to cool by circulation of air.

[0006] Although there is also much calorific value, it is made not to make the cause of filter burning of the liquid crystal display component by the partial temperature rise of the body of a back light, or the temperature rise of the whole back light further again by ventilated or exhausting compulsorily and carrying out cooling by circulation of air focusing on the part to which the temperature of a light source edge becomes high also in the case of the hot cathode tube of a bright thin figure, and the back light of the directly under light source method which made the fluorescent lamp the light source.

[0007]

[Embodiment of the Invention] While the first invention attains accommodation and equalization of a reflector of internal temperature by circulating air in the reflector used with the light guide plate method back light of a large size and super-high brightness A cold cathode tube enables it to use it under optimum temperature, and the fan who prepared in the nearest to an inlet is employed. After ventilating the open air compulsorily from the single-sided edge of a reflector and letting the inside of a reflector pass, Equalization is compulsorily considered as the temperature control inside a reflector sucking and by exhausting using a fan from the exhaust port which discharges from the exhaust port established in the single-sided edge, or prepared the air in a reflector in some reflectors, and a cold cathode tube enables it to use it under optimum temperature. This invention also enables it to adjust the temperature inside a reflector furthermore by attaching the fan for ventilation, and the fan for sucking to the both-sides section of the inlet section and the exhaust-port section as occasion demands, and ventilating powerfully.

[0008] The first example mentioned later is the back light of a large size and super-high brightness using the reflector which connoted five cold cathode tubes combined with one side. It ventilates in a reflector from ventilation opening prepared near the part the temperature of a part of single-sided edge of a reflector, i.e., a light source edge, becomes high using the fan controlled by the thermo sensor installed in the back light. When the air warmed at the light source edge flows between five cold cathode tubes By making it discharge from the exhaust port of the back light exterior through a duct from the exhaust port established in a part of opposite side edge of a reflector, after equalizing the skin temperature of a cold cathode tube as a result While equalizing the temperature in the reflector of the light source which consists of five cold cathode tubes, a cold cathode tube enables it to use it under optimum temperature.

Moreover, the second example is the back light of a large size and super-high brightness which has arranged the reflector which connoted three combined cold cathode tubes at the both-sides edge of a light guide plate. While equalizing the temperature in the reflector of the light source which consists of three cold cathode tubes sucking and by exhausting using the fan controlled by the thermo sensor from sucking opening which prepared the air in a reflector in the part Blast weight is controlled and a cold cathode tube enables it to use it under optimum temperature.

[0009] The second invention is a thing for what made the light source edge the structure exposed to the exterior of a reflector with the light guide plate method back light of high brightness. While decreasing the partial temperature rise of a back light by cooling ventilation or air by the flow of sucking and the artificial air which was made to exhaust and was made around the light source edge elevated-temperature-ized using a fan, or the elevated-temperature-ized light source edge A cold cathode tube enables it to use it under optimum temperature. In addition, since this method also doubles and sucks out the air in a reflector by preparing a vent hole in some reflectors, it has the effectiveness which equalizes the temperature in a reflector.

[0010] The third example mentioned later is the large size and the back light of high brightness which have arranged the light source using the reflector which connotes the cold cathode tube of 3 groups in which the edge was exposed at the both-sides edge of a light guide plate. Process heat-resistant high charges of a plate, such as silicone rubber, and the circumference of a part where the temperature of the light source edge exposed out of the reflector becomes high is enclosed partially. While decreasing the partial temperature rise of a back light by making it discharge from an exhaust port after ventilating and cooling in the above-mentioned enclosure section elevated-temperature-ized as resemble the fan controlled by the thermo sensor formed in the back light, a cold cathode tube enables it to use it under optimum temperature. Moreover, the fourth example is the large size and the back light of high brightness which have arranged the light source which used the reflector which connoted the fluorescent lamp to which the edge was exposed at the both-sides edge of a light guide plate. Process heat-resistant high charges of a plate, such as silicone rubber, and the partial circumference where the temperature of the light source edge exposed out of the reflector becomes high is enclosed partially. It cools by sucking out as fan \*\* which was heated by the fluorescent lamp and which installed the air of the above-mentioned enclosure section in the exterior of a back light, and is made to decrease the partial temperature rise of a back light. In addition, this method is the object which can also double and exhaust the air in a reflector by establishing an inlet in some reflectors of both sides.

[0011] The third invention is what is going to abolish the partial temperature rise of the back light of a directly under light source method. for example, many hot cathode tubes -- a base -- a drainboard -- it arranging to a \*\*, and a reflecting plate being formed in the bottom of it, and compulsorily the part to which the temperature of the light source edge of the back light of the method which a luminescence side is made to condense becomes high ventilation mainly Or it is made not to make the cause of filter burning of the liquid crystal display component according the air of the part to the partial temperature rise of equipment, or the temperature rise of the whole equipment sucking and by exhausted and cooling.

[0012] The fifth example mentioned later is the back light of the directly under light source type of the high brightness mold which has arranged six reflecting plates directly under the [ cold cathode tube ] directly under the diffusion plate which serves as the luminescence side which printed the pattern which erases a reflect lump of the light source to the down side. While making it the dark part of cold cathode tube both ends come outside a luminescence side for brightness equalization of a luminescence side, form the diaphragm for reflecting the light which escapes to a cold cathode tube both-ends side inside, a luminescence side is made to condense, and a bright luminescence side is acquired. Since the part to which the temperature of cold cathode tube both ends becomes high is taken out with this structure out of the diaphragm, the temperature under a luminescence side does not become not much high, but it is filled with heat, and in order to carry out the temperature rise of the part which took out out of the diaphragm, it has a possibility of becoming the cause of filter burning of the liquid crystal display component installed in the back light upper part. In order to form high brightness furthermore, when the

number of cold cathode tubes is increased and it arranges densely Since there is loam \*\*\*\*\* about the brightness fall of a cold cathode tube not only exceeding the cause of filter burning of a liquid crystal display component but exceeding optimum temperature By establishing ventilation and an exhaust port in some back lights, circulating air into the tubed part which connoted the cold cathode tube both ends constituted by a part, and the diaphragm and reflecting plate edge of the top face of the body of a back light, and a side face, and securing optimum temperature It is made the back light of the directly under light source type which eliminated the cause of filter burning of the liquid crystal display component resulting from the partial temperature rise of the body of a back light.

[0013]

[Example] Hereafter, each example of this invention is explained based on a drawing. It is an opening perspective view a part and the perspective view in which drawing 1 thru/or drawing 3 show the example of this invention, and drawing 1 shows the appearance of a back light, and drawing 2 are the part plans showing the detail of an internal device in which drawing 3's having taken out a part of drawing 2, and having shown the flow of air.

[0014] The back light 1 shown in drawing 1 is constituted by the light guide plate III with Body I, the luminescence side II, a reflective sheet, and a diffusion film, five combined cold cathode tubes 2, a reflector 1, a diaphragm 8, a thermo sensor 7, the ventilation opening 4 that attached mesh covering, the fan 6, the duct 3, and the exhaust port 5.

[0015] The center section of the body I is equipped with the luminescence side II. In the side edge section of one side of the light guide plate III with a reflective sheet and a diffusion film The back light 1 furnished with the reflector 1 which connoted five combined cold cathode tubes 2 Diaphragms 8I and 8RO close the both ends of a reflector 1, and ventilation opening 4a is further prepared in the single-sided edge of a reflector 1. Air A I which the fan 6 controlled by the thermo sensor 7 installed in diaphragm 7 RO by the side of the ventilation by the fan 6 who linked duct 3 I directly, i.e., an exhaust port, ventilates passes along the inside of a reflector. It flows towards the exhaust port 5 established in another single-sided edge, and is discharged as air A RO from the exhaust port 5 processed into the body through duct 3 RO attached in exhaust port 5a.

[0016] Thus, the internal temperature of the reflector by the side of an exhaust port is sensed with a thermo sensor 7, and while equalizing the internal temperature of a reflector 1 by the flow AI and ARO of the air which ventilated while controlling a fan's 6 airflow, when the internal temperature of a reflector 1 enables it to maintain the optimum temperature of a cold cathode tube, the bright back light 1 which carries out stable luminescence of the brightness near the highest brightness is made to be made. [0017] drawing 4 carried out opening so that drawing 4 and drawing 5 may show the second example of this invention and the principal part of a body configuration and an internal device could be seen -- it is an opening perspective view a part and drawing 5 wrote down the flow of air in drawing 4 -- it is an opening perspective view a part.

[0018] the back light 2 shown in drawing 4 -- a light guide plate with body 2I, luminescence side 2II, a reflective sheet, and a diffusion film -- it is constituted by the fan 26 with a thermo sensor who serves both as three combined cold cathode tubes 22, a reflector 21, the diaphragm 28 (not shown) which attached the vent hole, a duct 23, and an exhaust port 35 2 III.

[0019] The center section of body 2I is equipped with luminescence side 2II. At the both-sides edge of light guide plate 2III with a reflective sheet and a diffusion film The back light 2 of the structure which attached the reflector 21 which connoted three combined cold cathode tubes 22 is diaphragm 28 I (diaphragm 28 RO with a vent hole attached in another side is not illustrated, either.) which takes up the both ends of a reflector 21 and which attached the vent hole, It goes via the duct 23 attached in sucking opening 25a which incorporated air and was prepared in the center section of 2A I and the reflector 21. from -- when sucked out by the fan 26 with a thermo sensor who serves as an exhaust port 35 with a mesh-like front face (2A RO), it is \*\* in circulation \*\* about air at a reflector 21. In addition, the flow of the same air as the same component and same following as the above to the fan 26 with a thermo sensor who serves as the 21 or less reflector exhaust port which connoted the cold cathode tube 22 formed in the part to which opening of drawing 5 is not carried out was omitted in order to avoid duplication

explanation.

[0020] Thus, while the fan 26 with a thermo sensor senses and controls an exhaust-gas temperature and equalizing the internal temperature of a reflector 21 by 2A RO from flow 2A I of the air exhausted and made, when the internal temperature of a reflector 21 enables it to maintain the optimum temperature of a cold cathode tube, the bright back light 2 which carries out stable luminescence of the brightness near the highest brightness is made to be made.

[0021] drawing 6 carried out opening so that drawing 6 and drawing 7 may show the third example of this invention and the principal part of a body configuration and an internal device could be seen -- it is an opening perspective view a part and drawing 7 wrote down the flow of air in drawing 6 -- it is an opening perspective view a part.

[0022] the back light 3 shown in drawing 6 -- a light guide plate with body 3I, luminescence side 3II, a reflective sheet, and a diffusion film -- it is constituted 3 III by three combined cold cathode tubes 32, a reflector 31, exhaust ports 35I and 35RO, the enclosure plate 38 and the enclosure plate 39 with ventilation opening 34a, the duct 33, the thermo sensor 37, and the fan 36 from whom a mesh-like front face serves as the ventilation opening 34. In addition, the flow of the same air as the same component and same following as the above to the 31 or less reflector fan 36 who connoted the cold cathode tube 32 formed in the part to which opening of drawing 6 is not carried out was omitted in order to avoid duplication explanation.

[0023] The center section of body 3I is equipped with luminescence side 3II. At the both-sides edge of light guide plate 3III with a reflective sheet and a diffusion film The back light 3 furnished with the reflector 31 which connoted three combined cold cathode tubes 32 The reflector 31 which connoted the cold cathode tube 32 which made the part to which the temperature of both ends becomes high the form exposed from the light guide plate edge and the edge of a reflector 31, and attached it three It attaches in the both sides of the light guide plate 37 the reflective sheet which has luminescence side 3II in a front face, and with a diffusion film, and encloses with the enclosure plate 39 with ventilation opening 34a using the heat-resistant high charge of a plate. With a plate 38 It encloses near the both ends of the cold cathode tube 32 exposed from the reflector 31, and section 3H are made, and it encloses via a duct from the fan 36 controlled by the thermo sensor 37 attached in the interior of exhaust-port 35 I, it ventilates and (3A I) cools in the section, and discharges from an exhaust port 35 (3A RO).

[0024] Thus, the air (3A I) which ventilated from the fan 36 who entered from the wrap mesh-like ventilation opening 34, and was controlled by the thermo sensor 37 a fan's 36 front face Separate to a 2-way within a duct 33, enclose from ventilation opening 34a of the enclosure plate 39 with ventilation opening, and it blows in into section 3H. By discharging from exhaust-port 35 I 1 (3A RO 1), and discharging from exhaust-port 35 I 2 similarly, after cooling the part which cold cathode tube 32 edge high-temperature-izes, and its circumference (3A RO 2) While eliminating the cause of filter burning of the liquid crystal display component by the partial temperature rise of body 3I, an environment is prepared so that a cold cathode tube 32 can be turned on under optimum temperature, and the bright back light 3 which carries out stable luminescence can be made to do the brightness near the highest brightness.

[0025] drawing 8 carried out opening so that drawing 8 and drawing 9 may show the fourth example of this invention and the principal part of a body configuration and an internal device could be seen -- it is an opening perspective view a part and drawing 9 wrote down the flow of air in drawing 8 -- it is an opening perspective view a part.

[0026] The back light 4 shown in drawing 8 is constituted by light guide plate 4III with body 4I, luminescence side 4II, a reflective sheet, and a diffusion film, a fluorescent lamp 42, a reflector 41, the enclosure plate 48 and the enclosure plate 49 with exhaust-port 45a, the duct 43, the fan 46 with a thermo sensor, and the exhaust port 45. In addition, the flow of the same air as the same component and same following as the above to the 41 or less reflector fan 46 who connoted the fluorescent lamp 42 formed in the part to which opening of drawing 7 is not carried out was omitted in order to avoid duplication explanation.

[0027] The center section of body 4I is equipped with luminescence side 4II. At the both-sides edge of

light guide plate 4III with a reflective sheet and a diffusion film The back light 43 of the structure which attached the reflector 41 which connoted the fluorescent lamp 42 The reflector 41 which made it the form in which the part to which the temperature of both ends becomes high was exposed from the light guide plate edge and the edge of a reflector 41, and connoted the fluorescent lamp 42 It attaches in the both sides of light guide plate 4III the reflective sheet which has luminescence side 4II in a front face, and with a diffusion film, and encloses with the enclosure plate 49 with exhaust-port 45a using the heat-resistant high charge of a plate. With a plate 48 Enclose near the both ends of the fluorescent lamp 42 exposed from the reflector 41, and section 4H are made. The air which entered from the inhalation opening 44 passes along (4A I) enclosure section 4H, sucks out of sucking opening 45a of the enclosure plate 49 by the fan 46 with the thermo sensor via a duct, and discharges from the sucking opening 45 of covering attached to the fan 46 outside front face (4A RO).

[0028] Thus, the air (4A I 1) incorporated from inlet 44 I of a 2-way By the fan 46 who was heated by fluorescent lamp 42 edge in the above and enclosure section 4H, let the duct 43 pass from sucking opening 45a of the enclosure plate 49, and was controlled by the thermo sensor The bright back light 4 which eliminated the cause of filter burning of the liquid crystal display component by the partial temperature rise of \*\* and body 4I for sucking (4A RO) to be carried out with air 4A I 2 incorporated from inlet 44 RO is made to be made.

[0029] drawing 10 thru/or drawing 11 show the fifth example of this invention, and opening of drawing 10 was carried out so that the principal part of a body configuration and an internal device could be seen -- it is an opening perspective view a part and drawing 11 wrote down the flow of air in drawing 10 -- it is an opening perspective view a part.

[0030] Body 5I by which the back light 5 of the fifth example prepared luminescence side 5II in the center section, Luminescence side 5II using the diffusion plate which printed the dot pattern for erasing a reflect lump of the light source on a background, the bottom of luminescence side 5II -- a drainboard -- the light source by ten cold cathode tube 52a thru/or 52j arranged in the \*\* -- Duct 53 I connected to the diaphragm 59 formed in order to reflect in the luminescence side 5II side the light which is going to escape to each both ends of the reflecting plate 5I arranged directly under the light source, cold cathode tube 52a, or 52j, and the inhalation opening 54 at this, it connects to duct 53 RO -- having -- a surface car -- adhesion and arrangement -- it is constituted by the exhaust port 55 prepared in the body 5I edge used as the front face of the fan 56 with its \*\*\*\*\*, and a fan 56. 52d of in addition, cold cathode tubes formed in the part to which opening of drawing 10 and drawing 11 is not carried out -- or -- \*\* -- the flow of the air by the same component as the same component pan as the above formed in the part by which opening is not carried out by being in 52i and the opposite side was omitted in order to avoid duplication explanation.

[0031] Although the back light 5 by the above-mentioned configuration has the low brightness of cold cathode tube 52a thru/or 52i because of brightness equalization of luminescence side 5II, since it is taking out the part with much calorific value to body 5I one end outside the diaphragm 59, Although there are few temperature rises of a luminescence side 5II part, and the brightness of cold cathode tube 52a thru/or 52i is low, since the temperature of space 5H constituted by the edge of the 2nd page of the edge of body 5I and diaphragm 59 which connote a part with much calorific value, and a reflecting plate becomes high Incorporate air from the inhalation opening 54 prepared in another end face of body 5I (5A I), and the sucking opening 55 is formed in another end face. the fan 56 with a thermo sensor further for sucking -- an exhaust port 55 -- close -- it has arranged and led by duct 53 RO -- The bright back light 5 which eliminated the cause of filter burning of the liquid crystal display component by the partial temperature rise of body 3I by what (5A RO 1) the air heated in space 5H which connote a part with much calorific value is discharged for is made to be made.

[0032]

[Effect of the Invention] Although this invention is high brightness, in order that calorific value may also be made into a large luminescence side using many light sources and may make the back light of high brightness, Circulate air compulsorily in the reflector used for the back light of a light guide plate method using a fan. The fan who controlled by the thermo sensor is used for a part with many both



methods to the calorific value of a light source edge of a light guide plate and the directly under light source. Effectively Or ventilation or sucking, By exhausting, the partial temperature rise of reservation of whenever [ optimal temperature ] and the body of a back light is abolished, and it makes it possible to make a bright stable usable back light.

[0033] For example, although it will become about 40 percent of a brightness fall after [ lighting ] 5 minutes thru/or, and 10 minutes after the highest brightness if the back light of an example 1 is turned on without working a fan In the example 1, by working a fan, the air of ventilation or the applicable section is compulsorily sucked out for the need section using a fan, and this invention called cooling brings about a big effectiveness target as it ends after [ lighting ] 5 minutes thru/or, and 10 minutes after the highest brightness by about 1.5 percent of brightness fall.

[0034]

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[Translation done.]

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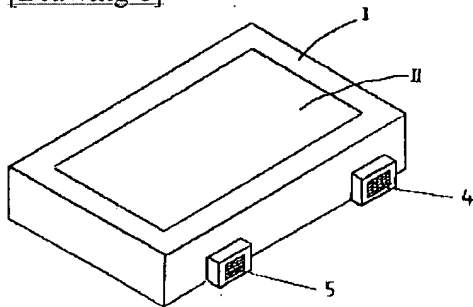
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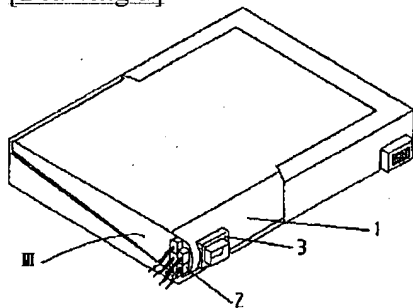
DRAWINGS

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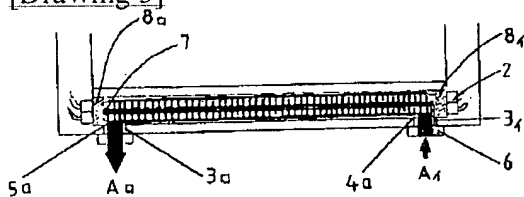
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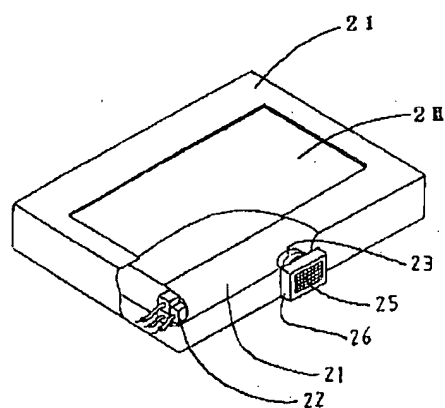
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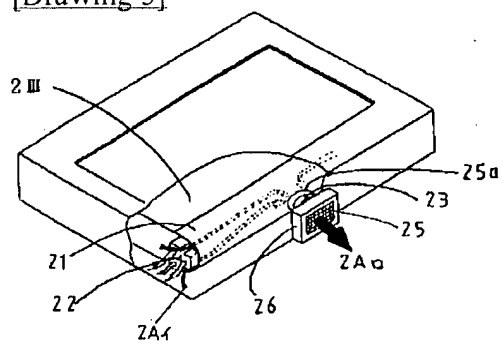
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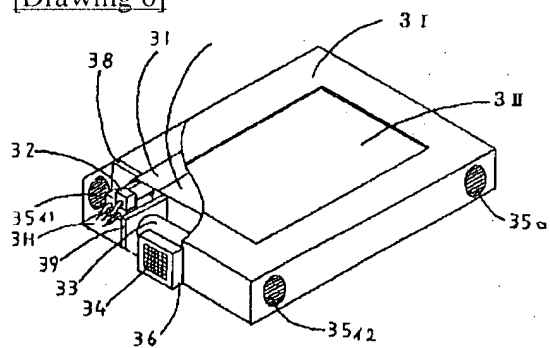
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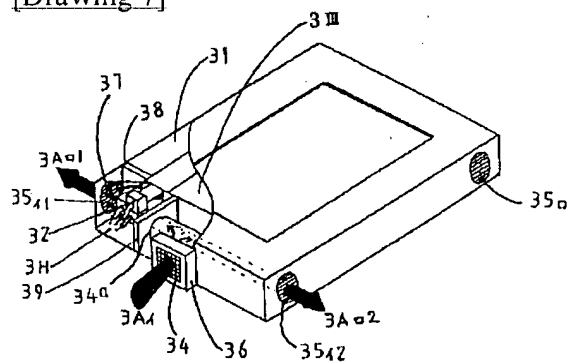
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Drawing 8]

